

IN THE CLAIMS:

1 1. (Currently Amended) A system for indexing and manipulating ~~a set of~~ backup data
2 stored on a destination storage system ~~interconnected with a plurality of source servers~~
3 ~~having source data from which the backup data is transmitted to the destination system,~~
4 comprising:

5 ~~the plurality of~~ one or more source servers configured ~~connected together~~ to trans-
6 mit the backup data to the destination storage system;

7 a management application executed by a processor, wherein the management ap-
8 plication is configured to (a) communicates with the destination storage system and fur-
9 ther configured to ~~that~~ accesses data identifiers related to the backup data organized in a
10 directory tree structure ~~and~~ representing a plurality of persistent consistency point images
11 (PCPIs) of the backup data, wherein each PCPI is ~~with~~ associated with information related
12 ~~to a creation time,~~ (b) scans a root of each ~~the plurality of~~ PCPIs comprising the directory
13 tree ~~stored on the destination storage system~~ to generate an index of directories, files, or
14 qtrees associated with the directory tree, ~~where each directory, file, or qtree has one or~~
15 ~~more versions created at one or more different points in time,~~ and (c) organizes the data
16 identifiers into a structure that enables the backup data to be displayed ~~according to direc-~~
17 ~~tory, file or qtree;~~ and

18 a user interface to select a directory, file, or qtree to view ~~and to select a source~~
19 ~~server from the plurality of source servers storing the selected directory, file or qtree,~~
20 wherein the management application is further configured to returns a list of ~~only the se-~~
21 ~~lected directory, file, or qtree and the one or more versions of the selected directory, file,~~
22 ~~or qtree, wherein each version of the selected directory, file, or qtree is stored in a sepa-~~
23 ~~rate PCPI and at least one version of the selected directory, file or qtree is stored on a sec-~~
24 ~~ond source server.~~

1 2. (Original) The system as set forth in claim 1 further comprising a database that stores
2 the data identifiers and rules for handling the data identifiers for retrieval by the user in-
3 terface and the management application.

1 3. (Currently Amended) The system as set forth in claim 2 further comprising, in the des-
2 | tination storage system, a network data management protocol (NDMP) extension, com-
3 | municating with a storage operating system of the destination storage system and provid-
4 | ing NDMP-based communication between the management application and the storage
5 | operating system.

1 4. (Original) The system as set forth in claim 3 further comprising a job framework that
2 | organizes a plurality of backup operations and restore operations by the management ap-
3 | plication and that communicates with the user interface so as to enable a user to access
4 | information with respect to status of the backup operations and restore operations organ-
5 | ized by the job framework.

1 5. (Previously Presented) The system as set forth in claim 4 further comprising a sched-
2 | uler that interfaces with the source system and that performs the backup operations,
3 | transmitting the backup data from the source system to the destination storage system at a
4 | predetermined time interval.

1 | 6. (Currently Amended) The system as set forth in claim ~~5-1~~ wherein the user interface
2 | ~~includes~~ comprises a screen that enables a user to set a desired lag time after which fail-
3 | ure to complete a scheduled backup operation caused an event to occur.

1 | 7. (Currently Amended) The system as set forth in claim 1 further comprising the user
2 | interface to ~~the user can~~ select (a) a listing of source data entries indexed by names of the
3 | source system and (b) a listing of source data entries indexed by names of volumes of the
4 | destination storage system in which the backup data from the source data resides.

1 8. (Currently Amended) The system as set forth in claim 7 wherein each of the entries of
2 | each listing ~~includes~~ comprises a browse backups button that enables a user to view

3 backup data stored on the destination storage system that is associated respectively with
4 each of the entries.

1 9. – 11. (Cancelled)

1 12. (Currently Amended) The system as set forth in claim 8 wherein each of the entries of
2 each listing ~~includes~~ comprises a restore button that enables a user to view restorable
3 backup data structures with respect to each of the entries and to restore the backup data
4 structures to the source data.

1 13. (Cancelled)

1 14. (Currently Amended) The system as set forth in claim 12 wherein each qtree ~~includes~~
2 comprises one or more qtree relationships with respect to other qtrees within the source
3 system.

1 15. (Currently Amended) The system as set forth in claim ~~14~~ 1 wherein the user interface
2 ~~includes~~ comprises a command for destroying a qtree relationship between the source
3 data and a selected volume of the backup data in the destination storage system.

1 16. (Currently Amended) The system as set forth in claim 15 wherein the management
2 application is ~~adapted~~ configured to delete a respective qtree associated with the qtree
3 relationship on the destination storage system in response to activation of the command
4 for destroying the qtree relationship.

1 17. (Currently Amended) The system as set forth in claim 1 further comprising, in the
2 user interface, a screen that enables selected data of the source data to be listed as entries
3 and to be transmitted as the backup data to the destination storage system at a time sepa-
4 rate from a scheduled backup time.

1 18. (Currently Amended) A method for indexing and manipulating a set of backup data
2 stored on a destination storage system ~~interconnected with a plurality of source servers~~
3 ~~having source data from which the backup data is transmitted to the destination system,~~
4 comprising:

5 communicating, by a management client, with the destination system and access-
6 ing data identifiers related to the backup data organized in a tree structure and represent-
7 ing a plurality of persistent consistency point images (PCPIs) of the data, each with asso-
8 ciated information related to creation time;

9 scanning the plurality of PCPIs ~~stored on the destination system to generate an in-~~
10 dex of directories, files, or qtrees, ~~where each directory, file, or qtree has one or more~~
11 ~~versions created at one or more different points in time;~~

12 organizing the data identifiers into a structure that enables the data to be displayed
13 according to the directory, the file, or the qtree ~~directory~~; and

14 selecting, on a user interface, a directory, file, or qtree to view ~~and selecting a~~
15 ~~source server from the plurality of source servers storing the selected directory, file or~~
16 ~~qtree, wherein the management application returns a list of only the selected directory,~~
17 file, or qtree created at different points in time ~~and the one or more versions of the se-~~
18 ~~lected directory, file, or qtree, wherein each version of the selected directory, file, or qtree~~
19 ~~is stored in a separate PCPI.~~

1 19. (Original) The method as set forth in claim 18 further comprising storing, in a data-
2 base, the data identifiers and rules for handling the data identifiers for retrieval by the
3 user interface and the management application.

1 20. (Currently Amended) The method as set forth in claim 19 further comprising provid-
2 ing, in the destination system, a network data management protocol (NDMP) extension;
3 communicating with a storage operating system of the destination system and providing

4 NDMP-based communication between the management application and the storage oper-
5 ating system.

1 21. (Original) The method as set forth in claim 20 further comprising organizing, in a job
2 framework, a plurality of backup operations and restore operations by the management
3 application and that communicates with the user interface so as to enable a user to access
4 information with respect to status of the backup operations and restore operations organ-
5 ized by the job framework.

1 22. (Currently Amended) The method as set forth in claim 21 further comprising interfac-
2 ing a scheduler with the source system and performing, at scheduled times, backup opera-
3 tions that transmit the backup data from ~~the a~~ source system to the destination system at a
4 predetermined time interval.

1 23. (Currently Amended) The method as set forth in claim 22 ~~wherein the user interface~~
2 ~~includes a screen that enables~~ further comprising enabling a user to set a desired lag time
3 after which failure to complete a scheduled backup operation ~~causes~~ caused an event to
4 occur.

1 24. (Previously Presented) The method as set forth in claim 18 further comprising select-
2 ing (a) a listing of source data entries indexed by names of the source system and (b) a
3 listing of source data entries indexed by names of volumes of the destination system in
4 which the backup data from the source data resides.

1 25. (Currently Amended) The method as set forth in claim 24 further comprising wherein
2 ~~each of the entries of each listing includes a browse backups button that enables~~ enabling
3 a user to view backup data stored on the destination system that is associated respectively
4 with each of the entries.

1 26. – 28. (Cancelled)

1 29. (Currently Amended) The method as set forth in claim 24 further comprising en-
2 abling ~~wherein each of the entries of each listing includes a restore button that enables a~~
3 user to view restorable backup data structures with respect to each of the entries and to
4 restore the backup data structures to the source data.

1 30. (Cancelled)

1 31. (Currently Amended) The method as set forth in claim ~~29-18~~ 18 wherein each qtree ~~in-~~
2 ~~cludes~~ comprises qtree relationships with respect to other qtrees within the source system.

1 32. (Currently Amended) The method as set forth in claim ~~31-18~~ 18 ~~wherein~~ further compris-
2 ing providing, in the user interface, a command for destroying a qtree relationship be-
3 tween ~~the~~ source data and a selected volume of the backup data in the destination system.

1 33. (Currently Amended) The method as set forth in claim 32 further comprising, in re-
2 sponse to activation of the command for destroying the qtree relationship, deleting a re-
3 spective qtree associated with the qtree relationship on the destination system ~~in response~~
4 ~~to activation of the command for destroying.~~

1 34. (Currently Amended) The method as set forth in claim 18 further comprising provid-
2 ing, in the user interface, a screen that enables selected data of the source data to be listed
3 as entries and to be transmitted as the backup data to the destination system at a time
4 separate from a scheduled backup time.

1 35. (Currently Amended) A method for managing backup of data ~~from a source server to~~
2 ~~a destination system and restore of backup data, relative to source data, from the source~~
3 ~~system to the destination system,~~ comprising:

communicating, by a management application, with each of the source server and the destination system and transmitting requests to read a data organization residing on each of the source server and the destination system to derive an index of directories, files, or qtrees for each of the source server and the destination system;

scanning a plurality of persistent consistency point images (PCPIs) stored on the destination storage system;

~~to generate~~generating the an index of directories, files, or qtrees in response to scanning the plurality of PCPIs, wherein each directory, file, or qtree has one or more versions created at ~~one or more~~ different points in time;

selecting a particular directory, file, or qtree to view; and

displaying, with a user interface communicating with the management application, each version of the particular only the selected directory, file, or qtree created at the different points in time ~~related to active data on the source server derived from source server index related to active data and the selected directory, file, or qtree related to backup data on the destination system derived from destination system index related to PCPIs transmitted from the source data during backup operations, wherein each version of the selected directory, file, or qtree is stored in a separate PCPI.~~

36. (Cancelled)

37. (Currently Amended) The method as set forth in claim 35 further comprising wherein ~~the steps of communicating and transmitting include~~ formatting information into a network data management protocol (NDMP).

38. (Currently Amended) The method as set forth in claim 35 further comprising activating user interface buttons associated with entries of the displayed ~~selected information-qtree~~ to conduct either of a backup operation and a restore operation with respect to the entries.

1 39. (Currently Amended) A computer-readable medium containing executable program
2 instructions executed by a processorsystem, comprising:

3 a ~~processor~~;

4 a ~~computer readable medium including program instructions executed on the~~
5 ~~processor to manage backup of data from a plurality of source servers to a destination~~
6 ~~system and restore of backup data, relative to source data, from each source server to the~~
7 ~~destination system, the program instructions performing the steps of:~~

8 ~~communicating, by a management application, with each of the source server and~~
9 ~~the destination system and transmitting requests to read a data organization residing on~~
10 ~~each of the source server and the destination system to derive an index of directories,~~
11 ~~files, or qtrees for each of the source server and the destination system;~~

12 program instructions that scanscanning a plurality of persistent consistency point
13 images (PCPIs) stored on ~~the a~~ destination storage system;

14 ~~to generate~~generating the an index of directories, files, or qtrees in response to
15 scanning the plurality of PCPIs, wherein each directory, file, or qtree has one or more
16 versions created at one or more different points in time;

17 program instructions that selecting a particular directory, file, or qtree to view;

18 and

19 program instructions that displaying, with a user interface communicating with
20 the management application, each version of the particularonly the selected directory,
21 file, or qtree created at the different points in timerelated to active data on the source
22 server derived from source server index related to active data and the selected directory,
23 file, or qtree related to backup data on the destination system derived from destination
24 system index related to PCPIs transmitted from the source data during backup operations,
25 wherein each version of the selected directory, file, or qtree is stored in a separate PCPI.

1 40. (Cancelled)

1 41. (Currently Amended) The computer-readable medium as set forth in claim 39 further
2 comprising program instruction that~~wherein the steps of communicating and transmitting~~
3 ~~include~~ formatting information into a network data management protocol (NDMP).

1 42. (Currently Amended) A system, comprising:

2 a source storage system configured to generate a plurality of persistent consis-
3 tency point images (PCPIs) associated with a particular directory tree, and further config-
4 ured to transfers the plurality of PCPIs ~~and data~~ to a destination storage system;

5 the destination storage system configured to executes a management client,
6 wherein the management client is configured to organizes the plurality of PCPIs ~~and the~~
7 ~~data~~ into an index using a database to allow the plurality of PCPIs ~~and the data~~ to be dis-
8 played in (a) a listing of source data entries indexed by ~~names of the particular directory~~
9 ~~tree~~directories, file or qtree of the source storage system, wherein each PCPI of the par-
10 ticular directory tree, file, or qtree ~~has one or more versions~~ is created at one or more dif-
11 ferent ~~points in times~~ (b) a listing of source data entries indexed by names of the source
12 storage system, and (c) a listing of source data entries indexed by names of volumes of
13 the destination storage system in which ~~the backup data from the source storage system-~~
14 ~~data~~ resides; and

15 an interface configured to select a data entry for the particular ~~a~~ directory tree, file,
16 ~~or qtree~~, and the management client further configured to returns a list of the plurality of
17 ~~only the PCPIs associated with the~~ selected particular directory tree, file, or qtree ~~and the~~
18 ~~one or more versions of the selected directory, file, or qtree, wherein each version of the~~
19 ~~selected directory, file, or qtree is stored in a separate PCPI.~~

1 43. – 45. (Cancelled)

1 46. (Previously Presented) The system of claim 42, wherein the database stores the plu-
2 rality of PCPIs and rules for handling the plurality of PCPIs for retrieval by the interface
3 and the management client.

1 47. (Currently Amended) The system of claim 42, wherein the source storage system,
2 upon initialization, sends a base PCPI and select data to the destination storage system.

1 48. (Currently Amended) The system of claim 42, further comprising a scheduler that
2 interfaces with the source storage system and performs backup operations of transmitting
3 the backup data ~~including comprising~~ one or more PCPIs and change data from the
4 source storage system to the destination storage system at a predetermined time interval.

1 49. (Currently Amended) A method, comprising:

2 transferring a plurality of persistent consistency point images (PCPIs) from a plu-
3 rality of source servers to at least one destination storage system;

4 scanning the plurality of PCPIs to create an index of data structures ~~in a database~~
5 on the at least one destination storage system, wherein each data structure ~~is a file, direc-~~
6 ~~tory, or comprises a plurality of qtree versions each and each data structure has one or~~
7 ~~more versions created at one or more different points in time and one or more versions~~
8 ~~stored on separate source servers;~~

9 selecting a particular data structure to view;

10 returning all qtree versions created at the different points in time for the particular
11 data structure ~~an entry for the selected data structure and entries for the one or more ver-~~
12 ~~sions of the selected data structure to allow a user to;~~ and

13 selecting a particular qtree from all the returned qtree versions created at different
14 points in time ~~entry to restore, wherein each version of the selected data structure is stored~~
15 ~~in a separate PCPI.~~

1 50. (Currently Amended) A ~~method~~system, comprising:

2 at least one source server configured to transfer a plurality of persistent consis-
3 tency point images (PCPIs) to at least one destination storage system;

4 a management application executed by a processor configured to scan the plural-
5 ity of PCPIs to create an index of data structures on the at least one destination storage
6 system, wherein each data structure comprises a plurality of qtree versions each created at
7 different points in time;

8 the management application further configured to select a particular data structure
9 to view and further configured to return all qtree versions created at the different points in
10 time for the particular data structure; and

11 a user interface configured to display all the returned qtree versions created at dif-
12 ferent points in time, and further configured to allow a user to select a particular qtree
13 from all the returned qtree versions to restore

14 ~~transferring a plurality of persistent consistency point images (PCPIs) from a~~
15 ~~source storage system to a destination storage system;~~

16 ~~scanning the plurality of PCPIs to create an index of a file in a database on the~~
17 ~~destination system, wherein the file has a plurality of versions with each version of the~~
18 ~~file stored in a separate PCPI;~~

19 ~~selecting the file to view and a source storage system from a plurality of source~~
20 ~~storage systems storing the selected file; and~~

21 ~~displaying the selected file and the plurality versions of the file to allow a user to~~
22 ~~select a particular file to restore from the selected file and the plurality versions of the~~
23 ~~file.~~